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ABSTRACT

The Rural Education and Agriculture Program (REAP) was initiated in response to perceived deficiencies in the rural primary schools of Belize. Since its inception in 1976, REAP has moved through two of its anticipated three phases (Pilot Phase, July 1976-June 1979; District-Level Phase, July 1979-June 1982). REAP integrates academic subjects with nine rural-life-related areas of study. Practical applications of both are made on REAP school farms which have Outdoor Education Centres with gardens, coops, hutches, etc. Evaluations were conducted in 1979, 1980, and 1981. Criterion-referenced measures were used to evaluate program objectives in: curriculum development; inservice training; academic achievement; attitudes of parents, students, and teachers; agricultural knowledge and skills; community involvement; and teacher training. Program criteria were reached or exceeded in all but agricultural knowledge, where insufficient data made conclusions impossible. During the anticipated National-Level Phase (July 1982 to June 1985) REAP will be expanded to cover approximately half the rural primary schools in Belize and the support role will be transferred from international to Belizean organizations. (BRR)

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THE RURAL EDUCATION AND AGRICULTURE PROGRAM (REAP): BELIZE'S NEW APPROACH TO RURAL PRIMARY EDUCATION

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The Rural Education and Agriculture Program (REAP): Belize's New Approach to Rural Primary Education

ROMEO M. MASSEY

The Center for Studies in Vocational Education,
Florida State University, and CARE

ABSTRACT

The rural primary schools in Belize and the development of the Rural Education and Agriculture Program (REAP) are described. REAP integrates academic subjects with nine rural-life-related areas of study. Practical applications of both are made on REAP school farms.

Data from three evaluations from July 1, 1976 - June 30, 1981 are presented. Criterion-referenced measures were used to evaluate program objectives in: curriculum development; inservice training; academic achievement; attitudes of parents, students, and teachers; agricultural knowledge and skills; community involvement; and teacher training.

Program criteria were reached or exceeded in all but agricultural knowledge, where insufficient data made conclusions impossible.

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PERSPECTIVES

Overview of Belize

Belize (formerly British Honduras) has a great deal in common with the other former British Colonies and Latin American nations of the Caribbean and Central America, but it also has a unique set of geographical, historical, cultural, and economic characteristics which set it apart from its neighbors.

In size it is a relatively small country, the second smallest in Central America, approximately 174 miles in length and has maximum width of about 68 miles (CARE, 1979). It also has a relatively small population of approximately 144,857 (Evensen, 1981) second only to French Guiana's miniscule population, among the nations bordering the Caribbean. This tiny population gives it an average of approximately 6 people per square mile, a source of great potential, but also of envy and possible conflict from its more crowded neighbors.

Although the Maya had made Belize a major food-producing area for their culture, neither the Spanish nor the English showed a great deal of interest in this region until the mid-17th century, when loggers began extracting the mahogany and other hardwoods which were so highly prized in Europe. British Honduras was declared a British Colony in 1862, gained self-governing status in 1964, and became the independent nation of Belize on September 21, 1981. A dispute with Guatemala concerning teritorial claims

delayed independence for two decades after most British colonies in the Caribbean had gained theirs.

Culturally, Belize is more diverse than any of its neighbors. Although the national language is standard English and is widely used, Creoles (Afro-Belizeans, who comprise about 40 percent of the population) are most likely to speak the Creole English dialect as a first language. Approximately 25 percent of the population are Mestizos (of Hispanic and Indian decent) and speak Spanish as their primary language. The descendants of the Maya, the Mopan Maya and Kekchi, are divided among those who speak the Mopan and Yucatec Maya dialects, and those who speak Kekchi. The Black Caribs (descendants of Africans and Carib Indians) speak Garifuna and predominate in the District of Stann Creek. East Indians are found in communities throughout the central and southern districts. In the past 20 years, German-speaking Mennonites have made an impact on Belizean agriculture far out of proportion to their numbers. In addition, a healthy sprinkling of Chinese and Lebanese merchants, along with the many tourists who now pass through Belize City, give it a multi-cultural flavor normally found only in large cosmopolitan areas.

The Belizean economy is centered around the sugar industry in the two northern districts, citrus farming in the Stann Creek Valley, fishing along the coast and keys, subsistence farming, and a smattering of tourism. Although almost 40 percent of the country is arable, and much of the national territory is held by the government (in contrast

to many Caribbean and Central American nations where land is concentrated in a rural oligarchy) only about 10 percent of the land suited to agriculture is in use (Evensen, 1981). The importation and dependence on foreign food sources is endemic, even in the most remote villages, and causes a drain on the local and national economies.

Although there are few people who exhibit the clinical signs of starvation, malnutrition is widespread. Poor physical conditions and sanitary practices lead to intestinal parasites, gastroenteritis, and "contribute to the prevalence of energy-protein malnutrition" (Evensen, 1981).

Subsistence farming, the relative lack of public services; unemployment and underemployment have all contributed to the exodus from the villages to the towns, Belize City, and overseas, where some people estimate that as many as 15-20 percent of Belizeans live. This mass movement from the rural areas to the cities exacerbates the country's underutilization of the potentially productive agricultural sector and places great stress on the overloaded urban communities.

Belizean Primary Education

The primary school system in Belize evolved as a church-state system of shared responsibilities and decentralized administration. This dichotomy of decision making effects every aspect of elementary education in the country. The Government, through the Ministry of Education (the Ministry) and District Education Officers, oversees the implementation of general curricular goals and instructional procedures. The Ministry provides most of the funds for school construction and teacher salaries. Twelve religious denominations administer the schools, with Roman Catholic, Anglican, and Methodists having the largest number of schools. These larger denominations appoint district Local Managers, who carry on the day-to-day administrative decisions concerning "their" schools' budgets, personnel, and long-range planning. General Managers for the denominations administer their school systems-within-the-system at the national level. Although the Government is clearly the dominant partner in the relationship, the religious denominations exercise certain functions in which they are semi-autonomous.

Primary education in Belize is free and compulsory to around age fifteen, and consists of eight grades of instruction (see Appendix-A for a comparison of Belizean and U.S. grade equivalents). To educate the children, there are 203 primary (elementary) schools in the nation, with approximately 150 of them (about 75 percent) in the

rural areas and villages. Of the approximately 34,000 students in the system's primary grades, about forty-five percent (15,300) are enrolled in rural schools. Many of the schools are located in one-room buildings of not-so-recent vintage, with between 90-150 students, separated into mixed grades of the Infant School (grades 1-3), Middle Primary (grades 4-5), and Senior Primary (grades 6-8) Divisions (see Appendix A).

The curriculum of the primary schools is generally structured on the British model of academic training in Mathematics, Language Arts, Science, Social Studies, the Arts, and Religion. Over the past several years, the Curriculum Unit of the Ministry of Education has prepared curriculum guides for most of these subjects and issued them to the schools. However, these curriculum guides provide only general areas where students are expected to receive instruction, and are liberally interpreted by the Local Manager, principals, and teachers when they translate them into daily, weekly, and yearly plans for instruction. Although this local implementation of the primary school curriculum allows for adaptations to fit the organizational characteristics of the schools and socio-economic backgrounds of the students, it has resulted in a patch-quilt pattern of primary school instruction. Quite often, schools from the same denomination and in the same district, separated by only a few miles, will have students in the same grades studying widely different subjects on different levels.

The instructional materials used in the schools are an amalgam of books gleaned from the Ministry and the central offices of the various religious denominations. Most of the more recent materials are from the United Kingdom and the United States. Consequently, much of the content of the instruction is written in culturally loaded concepts and language difficult for the rural Belizean child to comprehend. The instructional materials vary from school to school, regardless of the denominational affiliation of the school. Students receive instruction in content areas specified by the curriculum guides, but using different information sources.

The instructional methodology is quite traditional. Most instruction is provided by the teacher writing on a chalkboard and lecturing, while the children copy the lessons in their notebooks. Students play a passive role and learn most of their lessons by rote memorization.

The type and sophistication of instruction found in the classrooms is largely a result of the level of teacher preparation. Of the approximately 1,240 primary school teachers in Belize, about sixty percent (750 teachers) are in rural schools (Massey, 1979). Approximately 45 percent (CARE, 1979) of the "trained teachers" who go through three years of additional academic education, pedagogical training, and supervised internship at the Belize Teachers' College end up in the district town schools or Belize City. Although thirty-five percent of the teachers nationwide are "trained teachers," in the rural

primary schools approximately about 46 percent of the teachers are "uncertificated" i.e., no training, (CARE, 1979) and 80 percent are untrained i.e., not graduates of a teacher's college (Massey, 1979). In most cases, the principal of the school is a trained, experienced teacher, but the training of the staffs vary greatly, with the larger rural schools often having the better-trained, more sophisticated teachers.

Several types of examinations, all of which are written, are commonly used in primary schools. In-class tests are prepared by teachers and vary from one teacher to another, and from one year to the next. End-of-year grades are given in each school and determine which students progress to the next grade. The tests and the criteria for passing a grade may vary from school-to-school, and from year-to-year, regardless of the denominational affiliation of the schools.

The only national, standardized test which primary school children are required to pass to graduate from elementary school is the Primary School Leaving Certificate Examination (PSLCE). On the same day, students in all six districts who are considered ready to "sit" the PSLCE are tested in Mathematics, Language Arts, Science, and Social Studies. The assumption is made that the Standard VI (8th grade, see Belizean-U.S. grade equivalents, Appendix A) students sitting the PSLCE will have received instruction in all the areas tested in this survey-type examination. In the last three years, passing in each subject has been

determined by norm-referenced placement on a normal curve of all students sitting that portion of the PSLCE.

In addition to passing the PSLCE, students who wish to continue their educations in the secondary schools must compete for private high school openings on the Common Entrance Examination. Although much of the attention and effort of primary teachers is geared to assisting students to pass these examinations and go on to secondary school, because of poverty or poor preparation, approximately 40 to 50 percent of rural primary school children never go past the eighth grade.

Even for those who enter high school and complete it, the opportunities for higher education in Belize are very limited. A private Roman Catholic two-year college offers Associate of Arts and Associate of Science degrees, and an extension of the University of the West Indies offers college-level courses in conjunction with the Belize Teachers' College. In a system which has structured the primary and secondary school curricula along academic goals intended to lead to a university education, only a very small percentage of rural children can realistically be expected to overcome the academic, monetary, and social hurdles which block their paths. Thus, large numbers of rural children leave formal education with an academic emphasis on achieving unattainable goals, and with little preparation to transfer the academic knowledge and skills into practical terms.

The REAP Program

In September, 1975, an ad hoc committee convened to consider the deficiencies of the rural primary schools in Belize. Represented were the Ministry of Education and Sports, the Ministry of Social Welfare, the Ministry of Natural Resources (Agriculture), CARE, Heifer Project International, and the U.S. Peace Corps. This unique intra-ministerial and international agency group boldly decided to revise the entire structure of Belizean rural education by establishing the Rural Education and Agriculture Program (REAP). The REAP Advisory Committee, which evolved from the ad hoc group, emphasized that REAP was to be an educational-curriculum revision project first, and an agricultural science project only as a vehicle for new and innovative teaching methods. According to the REAP Committee, the purpose of REAP was:

> ". . . (to) initiate and evaluate efforts to enrich the rural primary school experience and, in particular, attempt to prepare the child for a potentially more rewarding and attractive role in the countryside. The project will approach the difficulties with a new educational philosophy that through the development of new, more relevant curricula, the rigorous training of teachers with an integrated rural development orientation, and the establishment of a school farm which

will serve, in effect, as an outdoor laboratory, the child can become better equipped to cope with rural life, both to the child's own benefit and, in helping him participate intimately in developing the agricultural basis of the national economy, to the benefit of Belize, as well."

"The thrust of the effort will be to integrate the different syllabuses with the rural environment, to make each subject taught bear directly upon the real world in which the children live and the problems they face there." (Government of Belize/CARE, 1976)

In the six years since its inception, the REAP program has moved through two, of the anticipated three phases.

In the Pilot Phase (July, 1976 to June, 1979) the goals were to:

1. Test the feasibility of the project, try various implementation strategies, and establish costs.
2. Use cooperation between ministries and international agencies as a basic strategy, personified in the REAP Advisory Committee.
3. Begin with international agencies providing the bulk of the technical assistance, material assistance, and logistical support, with the understanding that the Government of Belize (GOB) would assume more responsibility and costs as the project progressed.

4. Develop a revised curriculum, supportive curricular and instructional materials, inservice training materials, and a REAP program for the Belize Teachers' College. Each school would have an Outdoor Education Centre, which would consist of a new building, garden, and coops, hutches, etc. for the practical application of learning in an agricultural setting.
5. Provide project support, with the Ministry of Education supplying the school building and lands, retrained teachers and principals, and an Education Officer to act as Project Manager. Heifer Project International would supply, at cost, feeders, wire, chicks, baby rabbits, and some feeds. Peace Corps would supply volunteers who would act as technical support/coordinators for the pilot schools, as well as an Agricultural Lecturer for the Belize Teachers' College/REAP program. CARE would supply tools, equipment, some agricultural supplies, limited funds for the construction of Outdoor Education Centres, and logistical/transportation support.
6. Adopt and utilize a "Generalized Project Model" and a "Curriculum Development Model," which were to provide a procedural framework for the Pilot Project Phase of the REAP program (see Appendixes - B and C).
7. Establish the REAP program in eight pilot primary schools in Belize District, Stann Creek District, and Toledo District; in one secondary school in Stann Creek; and at the Belize Teachers' College.

In the District-Level Phase (July, 1979 to June, 1982) the goals were to:

1. Expand the REAP program to all six Districts in Belize, with a total of 23 REAP schools and 3 Informal REAP schools (schools receiving minimal assistance).
2. Transfer much of the technical assistance, material assistance, and logistical support from foreign agencies to the government's ministries, district-level officials, community groups, and service organizations.
3. Continue the development and revision of curricular and instructional materials, the inservice materials, and the program at the Belize Teachers' College (BTC).
4. Construct 14 storage buildings, which were to replace the function of the Outdoor Education Centres.

During the anticipated National-Level Phase (July, 1982 to June, 1985) the goals will be to:

1. Expand the REAP program to 65 REAP schools and 35 REAP Informal Schools, covering approximately half of the rural primary schools in Belize.
2. Complete the transfer of the support role from international to Belizean organizations.
3. Complete the development/revision of curricular and instructional materials, the inservice materials, and the program at BTC.
4. Construct an additional 43 storage buildings at REAP schools.

5. Establish linkages with other educational and training agencies, to provide an avenue for the continuing education and training of students interested in further rural-oriented education.

This final phase would be open-ended, in that the GOB would continue to expand the REAP program in rural primary schools, as well as urban primary schools, if appropriate.

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METHODOLOGY

In October, 1977, it was determined that the REAP project did not have measureable objectives that would provide valid criteria for an evaluation. The project proposals, formal agreements, memoranda from REAP project committee meetings, and other documents were reviewed to establish the originally intended goals of REAP. These "Statements for Program Evaluation" were put into a format congruent with a REAP Generalized Project Model (see Attachment-B) as follows:

1. Statement of the Problem - A statement describing an unsatisfactory condition which affects rural primary school students and/or Belizean society.
2. Limiting Condition(s) - A statement of factors which the REAP project must recognize as barriers to change.
3. Goal - A general purpose statement which indicates programatic directions for resolving the problem. Goals, in this definition, are not intended to be measured.
4. Objective(s) - A specific purpose statement which indicates targets to be met. These would form the basis for the planned project evaluations and must support progress towards the goal.
5. Strategies - Activities intended to accomplish the objectives. They would form the basis for the project work plan.

A draft of these statements was given to the principals and teachers of the REAP schools and the REAP Advisory Committee in four successive cycles of review/revision (November, 1977; March, 1978; October, 1978; October, 1980). The objectives stated were used as the criteria to evaluate REAP at the end of the 1978-79, 1979-80, and 1980-81 school years. Thus, the criteria represent consensus standards, rather than standards established by some objective or functional measure.

All data were collected directly from the sources, the 16 REAP schools involved in the Pilot and District-Level phases of the REAP project, and that had sufficient involvements to make their inclusion valid.

In the case of academic achievement, only scores on the Primary School Leaving Certificate Examination (PSLCE) were considered reliable and valid. Scores of students in Standard (Std.) VI (8th Grade) in REAP schools were compared with scores of students in non-REAP schools. Non-REAP schools were selected as the control group based upon similarities with REAP schools in location, size, ethnic background of the students, and size/sophistication of the staffs. A two-tailed F-ratio test, using the F-distribution, was used to test the homogeneity of the two population variances on the PSLCE scores. Appropriate t-Tests were then applied to compare the average scores of the REAP and non-REAP students.

The opinionnaires were the most subjective of the measures. These open-ended questions about the attitudes

of teachers, students, and parents dealt with the REAP program, agricultural methods, and agriculture as a career. Teachers were asked to respond individually. Teachers were instructed not to prompt students into written responses to identical questions. Respected community leaders were asked to meet with parents in their homes and have them fill out the same questionnaire, without coaxing them. Responses were read by the evaluator, divided into positive, neutral, and negative categories, and percentages of the totals made for each responding group. Only teachers, students, and parents who had a full-year of REAP were surveyed, and they were surveyed only once.

For the purpose of this study, only findings in areas where comparable data were available for a three-year period and which might be of general interest were reported. These areas included curriculum, inservice training, academic achievement, attitudes, agricultural knowledge and agricultural skills, community involvement, and teacher training. For the sake of brevity, only the problem statements and objectives were reproduced along with the findings.

DATA SOURCES

This study is a compilation of the data and findings of the 1979, 1980, and 1981 REAP evaluations. The conclusions are based on the data and observations made in 12 visits, over four and one-half years, covering approximately 138 days.

FINDINGS OF THE STUDY

The problem statements and objectives in this section represent an abbreviated form of the "Statements for Program Evaluation." Each problem lists all of the objectives in that area that were undertaken by REAP. Minor modifications were made in the wording approved by the REAP Committee to adjust to the five-year scope of the present study.

Problem Statement Number 1: Curriculum Development and Academic Achievement

> Primary school children find it difficult to learn from an academically-oriented curriculum compartmentalized into subject areas. The learning difficulties are increased by irrelevant instructional materials, also compartmentalized into subject areas. Thus, the children do not participate in learning activities which integrate their environmental experience and need for practical skills into the curriculum.

Objective 1.1: REAP teachers and principals will develop, review, and revise a REAP Curriculum Guide.

The first REAP Curriculum Guide was developed in July, 1977, by 14 teachers and principals of the REAP schools, four Peace Corps Volunteers (PCVs) assigned to REAP, two Ministry of Education representatives, and a representative from CARE. The 51 page document divided the subject matter into nine "REAP Areas of Study": Soils, Plants, Animals,

Agricultural Practices, Weather, Land/Water, Village Study, Health and Nutrition, and Ecology. It specified broad instructional goals (called objectives), materials required, learning activities, and suggested reading references. A major effort was made to integrate the academic learning with practical applications in the school's environment.

Although it was a fine first step, the curriculum guide did not specify how REAP was to be used in conjunction with the ongoing curricula, did not have measureable learning outcomes, and had no method for training teachers to use it.

A second version of the REAP Curriculum Guide was produced by a similar group in August, 1979, and a third in August, 1980. These guides specified instructional aims (goals) within the nine REAP Areas of Study, and divided the content presentation into three levels: Introductory (for Std.IV, 6th grade students); Developmental (involving skill acquisition, for Std.V, 7th grade students); and, Consolidatory (practical skills, for Std.VI, 8th grade students). The most recent Guide contains a yearly scheme for each of the three years in Senior Primary and was developed in collaboration with the Ministry's Curriculum Development Unit. The latter versions of the Guide assume use of the REAP Learning Activity Packs (REAP/LAPs) and inservice materials (see 1.2, 1.3).

The development of the curriculum guides and their subsequent revision meets the broad criteria stipulated in the objective. Twenty-three REAP schools are presently using the guide, but it remains to be seen if the complete

integration of academic and practical knowledge, skills, and attitudes can be achieved. At this stage, the REAP curriculum functions as a parallel structure of the established curriculum and has not replaced its more academic predecessors, as envisioned by the original REAP Advisory Committee. It serves to provide a practical proving-ground for lessons learned.

In addition, the emphasis of the REAP curriculum in the primary grades has shifted to the Senior Primary Grades (Stds.IV-VI, grades 6-8). Children in lower grades, except those in schools that have made special adaptations for REAP, are not completely included in the REAP activities.

Objective 1.2: REAP will develop and revise a standardized inservice training program that will train teachers to develop and use REAP/LAPs.

The Ministry of Education's Curriculum Development Unit, because of limited personnel and their involvement in producing curriculum guides for the academic subject areas, was not able to undertake the task of developing instructional materials to implement REAP. Following the format of a large curriculum development/inservice training program in the State of Florida, the REAP Advisory Committee decided that the development of Learning Activity Packs (LAPs) would be an appropriate solution to several instructional problems. LAPs would provide a vehicle for transmitting both knowledge and skills, in an activity-based

format, which was useable in all nine REAP Areas of Study. The LAP format would provide measureable objectives and a structure for integrating the academic with the practical. LAPs would solve the problem of standardized learning materials by supplying all the necessary content. And finally, LAPs were relatively inexpensive to reproduce and within the Ministry's capabilities. The inservice materials, therefore, are aimed at preparing teachers to develop and use REAP/LAPs.

The REAP Inservice Guide (Ministry of Education, 1979) and supportive materials are composed of a printed manual of approximately 75 pages (given to each participant), an audio cassette, and 175 slides. Together with the learning activities and practice, they provide approximately 2 1/2 days of structured, activity-based instruction in:

1. the basic concepts of REAP
2. writing goals and measurable objectives
3. the concept of activity-based instruction and ten activity-based teaching methods
4. introduction to the format of REAP/LAPs
5. practice in developing REAP/LAPs
6. using REAP/LAPs in daily and weekly lesson plans

These materials were tested in a pilot inservice program in March, 1978, and revised in subsequent inservice sessions.

In addition to a half-day REAP orientation, a two-day curriculum workshop, and an eight-day curriculum workshop,

REAP teachers and principals also receive a two-day agricultural workshop based on a 123 page agricultural manual called "Let's All REAP Together" (Turner, 1979) which provides the basics of tropical gardening, chicken raising, and rabbit raising. Trained personnel from the Ministry of Natural Resources and the Belize Teachers' College REAP Lecturer have served as technical advisors in these workshops.

It is anticipated that a second resource manual on Health and Nutrition will soon be developed and be used in a similar fashion to provide REAP teachers the technical skills they need.

The inservice materials have been used to train the staff of all 23 REAP schools, as well as student-teachers in the Belize Teachers' College. The materials have also been used locally by experienced REAP principals and teachers to train others. During the National Level Phase of REAP, all inservicing will be coordinated through local REAP teachers, principals, and District Officers, who will conduct inservice sessions in all six Districts of the country using the materials.

These methods have been highly successful in training teachers to produce REAP/LAPs, but continue to have less than the maximum desired effect because of insufficient follow-up inservice training on the school level.

Objective 1.3: REAP teachers will produce and/or revise REAP/LAPs, including sample integration activities, at a

rate of 3 LAPs per Area of Study, per year (3x9=27 per year) for Stds.IV-VI, and 1 LAP per Area of Study, per year (1x9=9 per year) for the Infant Division and the Middle Primary Divisions.

The production and revision of REAP/LAPs for the Infant and Middle Primary School Divisions was deferred by the REAP Advisory Committee, in order to concentrate on development of REAP/LAPs for the Senior Primary grades. This portion of the program objective was not accomplished.

REAP/LAPs were produced in all nine of the Areas of Study and revised in 1978, 1979, 1980, and 1981. A total of 117 LAPs were developed, with 102 included in the most recently printed manual (Ministry of Education, 1981). The development of REAP/LAPs for the Senior Primary Grades, where REAP is most active, exceeded the program objectives in all appropriate years.

The quality of REAP/LAPs has varied considerably (see example, Appendix-D) but has generally been of acceptable standards.

The major content problem with the LAPs has been the lag in producing simple resource materials for inclusion in the LAPs. Without this, teachers have found problems in locating appropriate technical materials and have spent much time and effort in completing the LAPs. It has been necessary to summon subject matter experts to fill in the gaps where the REAP teachers were lacking this information.

The other problems dealing with LAPs are more bureaucratic than substantive. REAP teachers have, on occasion, had to duplicate their lesson plans, instead of using the REAP/LAPs, in order to satisfy the District Education Officers during school reviews. Belize Teachers' College Student Interns have been reluctant to use the LAPs because they feel that the BTC Internship Supervisors might not accept them, in the same way they would accept their use of standard lesson plans. Both of these cases have persisted and can be expected to continue until the REAP curriculum is nationally recognized as the curriculum in the rural primary schools.

Objective 1.4: Achievement of REAP students in the Primary School Leaving Certificate Examination (PSLCE) will be at least as high as Non-REAP students in similar schools.

The original attempts to measure and evaluate academic achievement using end-of-year grades and other in-school examinations were abandoned because no valid comparisons could be made with changing lists, teachers, instruction, etc.

As seen in Table 1, the average scores of approximately 509 Non-REAP students and 546 REAP students were compared on the 1979, 1980, and 1981 PSLCE. The scores of the REAP students were higher on all parts of the PSLCE, where valid comparisons were possible, in all three years. Using the t-statistic, these differences were significant in six of the nine examinations.

TABLE 1: A Comparison of REAP and Non-REAP Student Achievement on the Primary School Leaving Certificate Examinations for 1979, 1980, and 1981, Using the t-Test.

	NON-REAP STUDENTS			REAP STUDENTS		
	Mean	Standard Deviation	n	Mean	Standard Deviation	n
1981						
Math	8.92	5.86	182	10.21	13.21	227
Science	19.77*	5.15	180	21.50*	9.22	224
Soc. Stud.	27.72	7.48	180	28.06	6.84	220
Lang. Arts	24.27*	8.46	181	26.95*	13.54	218
1980						
Math	11.90***	5.62	197	13.86***	5.42	198
Science	a	a	a	a	a	a
Soc. Stud.	28.28**	8.03	199	30.15**	6.21	197
Lang. Arts	28.09*	8.55	198	29.93*	8.06	198
1979						
Math	21.64	6.03	130	22.48	6.66	124
Science	b	b	b	b	b	b
Soc. Stud.	b	b	b	b	b	b
Lang. Arts	33.77**	8.90	130	36.96**	8.84	130

a. No valid data were availabe for the Science portion of the 1980 PSLCE for comparing REAP and Non-REAP students.

b. No valid data were available for the Science and Social Studies portions of the 1979 PSLCE for comparing REAP and Non-REAP students.

* $P < .05$ for comparison of mean scores of REAP with Non-REAP

** $P < .01$ for comparison of mean scores of REAP with Non-REAP

*** $P < .001$ for comparison of mean scores of REAP with Non-REAP

Although these higher scores could not be attributed to REAP, the fear that REAP would damage the academic achievement of students has not proven valid, based upon such a comparison.

Problem Statement Number 2: Attitudes about REAP and Agriculture

Many rural parents, teachers, and students do not view agriculture, as presently practiced, as offering the prospects for a higher standard of living.

Objective 2.1: Seventy percent (70%) of the parents, teachers, and students from REAP schools which have completed one year of REAP will indicate positive opinions concerning appropriate agricultural techniques and their potential for a profitable and rewarding career.

The three-question opinionnaire was used with 16 REAP schools after the REAP program had been in operation at each school for at least one year. The results represent a total of 274 responses (48 teachers, 124 students in Std.VI, and 102 parents of students in Std.VI) on the three questions in 1979, 1980, 1981.

Tables 2, 3, and 4 show that there were overwhelmingly positive responses to the three questions (see table footnotes for questions), all in the 88-100 percent range. Caution must be taken in interpreting the results of an opinionnaire that is so vulnerable to systematic bias. However, direct observation and details provided by the written responses

TABLE 2: Responses to Question Number One[1] of the 1981 REAP/Agricultural Attitude Survey, With Summary Data From the 1980 and 1979 Surveys.

	Total Responses	Positive Responses		Neutral Responses		Negative Responses	
	No.	No.	%	No.	%	No.	%
Teacher Responses	10	9	90	1	10	0	0
Student Responses	55	55	100	0	0	0	0
Parent Responses	32	28	88	3	9	1	3
Total Responses 1981	97	92	95	4	4	1	1
Total Responses 1980	107	105	98	0	0	1	2
Total Responses 1979	70	65	93	3	4	2	3

1. The responses were given to the question "Have you (your students, or your child) benefited from the new agricultural programme at the school called REAP? Give reasons and explain."

TABLE 3: Responses to Question Number Two[1] of the 1981 REAP/Agricultural Attitude Survey, with Summary Data From the 1980 and 1979 Surveys.

	Total Responses	Positive Responses		Neutral Responses		Negative Responses	
	No.	No.	%	No:	%	No.	%
Teacher Responses	9	9	100	0	0	0	0
Student Responses	55	55	100	0	0	0	0
Parent Responses	32	28	88	3	9	1	3
Total Responses 1981	96	92	96	3	3	1	1
Total Responses 1980	99	96	97	0	0	3	3
Total Responses 1979	69	63	91	5	7	1	2

1. The responses were given to the question "Do you know of any new agricultural methods you (your students, your child) have learned at school? If so, what do you think of them?"

TABLE 4: Responses to Question Number Three[1] of the 1981 REAP/Agricultural Attitude Survey, with Summary Data from the 1980 and 1979 surveys.

	Total Responses	Positive Responses		Neutral Responses		Negative Responses	
	No.	No.	%	No.	%	No.	%
Teacher Responses	9	9	100	0	0	0	0
Student Responses	55	52	94	1	2	2	4
Parent Responses	32	30	94	2	6	0	0
Total Responses 1981	96	91	95	3	3	2	2
Total Responses 1980	74	72	97	0	0	2	3
Total Responses 1979	70	66	94	1	1	3	5

1. The responses were given to the question "Do you think new agricultural methods can make agriculture a worthwhile occupation?"

seem to indicate widespread enthusiam for the REAP program and new agricultural methods among teachers, students, and parents.

One interesting finding was the number of parents who said that they were changing the way they farm because of the higher yields their children have in home gardens. Also, many parents responded that the new agricultural methods held the promise of a brighter future than the traditional practices.

The overall conclusion which can be drawn is that the anticipated negative reaction from the students, parents, and teachers has not materialized, and on the contrary, REAP has strong support and is fostering more positive attitudes towards agriculture.

Problem Statement Number 3: Agricultural Knowledge and Skills

The under-utilization of resources and inappropriate agricultural techniques contribute to the low agricultural productivity of Belize.

Objective 3.1: Eighty percent (80%) of students in Stds.IV, V, and VI will demonstrate the acquisition of modern agricultural knowledge, skills and/or attitudes by successfully completing six (6) agriculturally-related LAPs each school year (1979-80, 1980-81, and 1981-82).

It has proven extremely difficult to document the use of agriculturally-related REAP/LAPs because of the manner

in which the principals have made their reports. The first statement of the objective (1979) did not limit the use of LAPs to those directly related to agriculture.

As seen in Table 5, from 69 percent to 91 percent of students attempting REAP/LAPs in the 1978-79 school year were reported by the principals as having successfully completed them. It was not possible to state if students were completing six agriculturally-related LAPs per year. Through observation and speaking with the staff, it is possible to state that the LAPs have not been used to the extent that they could be.

Objective 3.2: Each REAP student in Stds.IV, V, and VI will participate in practical learning activities involving the intensive cultivation of small plots of land and/or producing rabbits, chickens, or honey, for a minimum of 50 hours each school year.

Again, because of the manner in which the data were returned, it was not possible to verify if the objective was accomplished. However, through observation, by talking with the teachers, principals, and REAP staff form the Ministry of Education and CARE, it is possible to make a rough calculation of what would be the likely average time spent in gardening and raising animals by REAP students. In almost all of the schools, REAP students spend at least 30-45 minutes each day in their agricultural pursuits. Estimating only 140 school days per year, per child, at these rates the average time would be approximately 70

TABLE 5: Number and Percentage of REAP Students Attempting and Successfully Completing Learning Activity Packs (LAPs) September, 1978 to May, 1979.

LAP Number	Number Students Attempting LAP	Number Students Successful	Percent Successful
1.1	269	216	80.30
1.2	34	30	88.23
1.3	285	219	76.84
1.4	210	178	84.76
1.5	89	70	78.65
2.1	282	228	80.85
2.2.1	246	195	79.27
2.2.2	145	111	76.55
2.3	189	154	81.48
3.1	247	190	76.92
3.1.2	249	190	76.30
3.2	209	151	72.25
3.3	54	46	85.18
3.4	206	179	86.89
3.6	30	24	80.00
3.7	54	47	87.03
4.1	225	177	78.66
4.2.1	261	216	82.28
4.2.2	73	63	86.30
4.3	126	108	85.71
4.5	48	33	68.75

hours to 105 hours per child . In many cases the children spend more time per day and even come after school and on weekends, on their own! It has not been a problem to get students sufficient practical experience. On the contrary, it has been necessary to constantly remind the REAP teachers that the educational aspects of REAP must not be disregarded by emphasizing agriculture too much.

Agricultural production has been quite impressive, (see Table 6) but uneven. The highest average agricultural production, per school, was during the 1978-79 school year, when there were only eight REAP schools and BTC. The reason is that during that year, each of the schools received all of their agricultural inputs (chicks, rabbits, and feed from Heifer Project International; wire, feeders/waterers, seeds, pesticides from CARE) from the participating international agencies. Also, Peace Corps Volunteers (PCV's) were working with each of the schools during their last year of the Pilot Phase of REAP.

The next year (1979-80) the PCV's left most of the schools, and Heifer Project began stressing local sources of agricultural supplies. Agricultural production went down, only to begin to climb again the next year (1980-81) as the schools began to find ways of acquiring supplies for themselves. All the schools, however, have produced enough to generate small net profits, which should pay for future projects.

A major function of the REAP District Councils (which will be composed of representatives from GOB, the schools,

TABLE 6: Agricultural Production in 16 REAP Schools and the Belize Teachers College for 1980-81 School Year, With Summaries and Totals of Previous Years.

Agricultural Production/Year	Number Schools	Chickens Raised	Rabbits Raised	Produce in Lbs.	Total Farm Area (b)
1980-81 REAP	16	823	51	2,567	10.76
1980-81 BTC	1	125	4	20 (d)	
1979-80 REAP	14	528	22	(a)	10.38
1979-80 BTC	1	220	0	60 (c)	
1978-79 REAP	8	748	54	3,137	3.05
1978-79 BTC	0	0	0	0	
TOTAL PRODUCTION 1978-1981		2,444	131	5,704 (e)	10.76

(a) approximately 70 harvests were recorded in 1979-1980: no weights were recorded

(b) area in acres

(c) 10 gallons of honey were produced at BTC during 1979-1980

(d) 88 lbs. of honey were produced at BTC during 1980-1981

(e) approximately half of all the vegetables produced were taken home by students or consumed at school, much of this was not included in the total shown

and the communities) will be to assist the REAP schools to find reliable sources of agricultural supplies necessary for maintaining the programs established with the assistance of the international agencies. Major new initiatives are planned to provide REAP school leavers (including graduates) additional training and education in agriculture, if they so desire. In addition, a study is in progress which will document if REAP students are involved in agriculturally-oriented activities after leaving the program, and comparing them to students who have not participated in REAP.

Problem Statement Number 4: Community Involvement

Rural schools are not focal points of the communities and do not receive sufficient community support to maximize the effectiveness of educational programs.

Objective 4.1: Parents and other community members (a number equal to 10% of the student enrollment) in REAP Schools in the program for one year will contribute in service or kind to the accomplishment of the REAP Objectives.

The data received from the principals about contributions of work on material didn't allow for a direct evaluation of the objective. However, in speaking with the principals and REAP staff, and from personal observation, there is little doubt that this criterion was met and

surpassed. In many of the communities where REAP schools are located, the program has acted as a catalyst and has resulted in the first community projects in memory.

Three stages to the community's contributions have become apparent. At first, when the principal begins explaining the new REAP program, the parents and influential community members are a bit reluctant to participate. Then, after the program is initiated and the CARE tools, equipment, and material begin arriving, there is a rush of activity and projects. After the first year or two, the contributions continue, but usually must be requested by the principal.

Once REAP has begun in a school, the communities have responded with all types of help (see Appendix-E) the most common being labor. The communities have cleared the bush and prepared the land for the gardens in all 23 REAP schools. They have cut the posts, set them, and strung the wire for the garden fences. They have built the twenty-seven chicken coops and rabbit hutches presently in use. Seven Outdoor Education Centres (measuring 20' x 26') were constructed, with mothers, fathers, sons and daughters working together making or setting blocks, mixing cement, raising roof timbers, and applying the finishing touches. Fourteen smaller Storage Building (10' x 12') have also been built. In two communities wells for the school gardens were laboriously dug, one more than 25 feet deep!

The problem of community contributions, if it can be called a problem, is to find enough projects to keep the

parents busy after the initial phase of construction. A major new development is the involvement of community service organizations in REAP. In one village the Lions Club members helped organize the community and built a 20' x 26' REAP building. In two Northern Districts, the Rotary Clubs of Orange Walk and Corozal, as well as Rotary International, are negotiating a project for extensive participation in assisting REAP schools organize projects and overcome problems. This type of community involvement promises to bring continuity and planning to local REAP projects.

Objective 4.2: Parents and other community members (a number equal to 50% of the student enrollment) in REAP Schools in the program for one year, will attend one or more special events.

Again, exact data were not available. It is estimated that the cook-outs, Parent Teacher Association meetings, work days, and special REAP days equalled, if not surpassed the criterion.

Problem Number 5: Teacher Training

The majority of students at Belize Teachers' College have no formal training in rural-oriented education, such as that in the REAP project, and therefore do not have the knowledge and skills to assist pupils in rural areas to better adapt to the environment.

Objective 5.1: A REAP curriculum will be established at the Belize Teachers' College (BTC) which will be accepted by the BTC Board of Governors as an integral part of the first and second-year curriculum. The REAP/BTC curriculum will give the students, by the start of their internship, a basic awareness of the goals and objectives of the REAP program and the basic knowledge and skills to teach in a REAP school, as well an initiate REAP-type programs in other primary schools.

From the very beginning, the REAP Advisory Committee had envisioned the establishment of REAP at the Belize Teachers' College (BTC) as a critical component in the transformation of the rural primary schools. The Belize Teachers' College is actually a teacher retraining institution, in that it takes "untrained teachers", who are already working in schools, and puts them through a two-year program of advanced academic training and educational methods, and a one-year supervised teaching internship.

After an abortive attempt by a Peace Corps Volunteer to establish REAP at BTC in 1976-77, CARE provided for the services of the first REAP/BTC Lecturer in January, 1978. This individual, with CARE support for materials and supplies, was able to begin the construction of the Outdoor Education Centre, coops, and the garden area by February, and prepared the first REAP syllabus and activity cards (patterned after the REAP/LAPs) soon afterwards.

The first REAP curriculum, which was accepted by the BTC Board of Governors in March, 1978, called for REAP to be a mandatory subject for all first and second-year BTC student teachers. Students received more of a general academic orientation to agriculture, than did the REAP teachers in summer inservice workshops, but were also required to spend time in the garden and animal raising projects. The REAP Inservice Guide materials were progressively infused into the curriculum. In March, 1979, an agricultural manual entitled, "Let's All REAP Together" (Turner, 1979) was developed for REAP teachers and BTC Student-Teachers and reproduced by the Caribbean Reprographic Unit in Jamaica.

Recognition of the program came quickly. In March, 1979 the REAP/BTC curriculum received full accreditation as a college course by the University of the West Indies, BTC's accreditation organization, and in June, 1979, the final examination for the second-year REAP course at BTC was approved by the External Assessors from the University of the West Indies.

Two Peace Corps Volunteer Agricultural Educators have continued the development of the curriculum, which presently is a required subject for first-year BTC students, and an elective for the second year. The REAP/BTC program has survived bare-bones budgets and tumultuous times at BTC, but it still remains to be seen if the Ministry will institutionalize the program by appointing a qualified Belizean to the post of REAP/BTC Lecturer.

Objective 5.2: The Outdoor Education Centre, which includes outdoor lecture/storage building, garden plots, nursery, animal cages and fence will be completed by June, 1979.

The building and coops at BTC were constructed on schedule, using assistance from the Belize Technical Institute. Recently a second building was constructed to house the Veterinary Science animals from the Technical Institute's programs.

Even with the poorest environmental conditions of any REAP school, and against the marauding attacks of raccoons, iguanas, and boa constrictors from the adjoining mangrove swamp, the production of vegetables, honey, and chickens has been sufficient to pay for a portion of the operating expenses and give the students the practical experience they need.

Objective 5.3: Each second-year student teacher will produce and revise 2 REAP/LAPs.

The second-year REAP/BTC students have exceeded the criterion each year since the first graduation in June, 1980 of students who had been involved with two complete years of REAP. The 40 to 60 REAP/LAPs produced each year were intended to be infused with the LAPs produced at curriculum workshops. In 1981, this happened for the first time and should continue as an additional source for curricular materials.

Objective 5.4: By the end of the second year of REAP, each REAP student will participate in at least three field trips and/or seminars related to rural life education and REAP.

This objective was not accomplished during the 1979-1980 and 1980-1981 school years, due to a lack of transportation, organizational problems at BTC, and political unrest in the country. However, the objective was reached and surpassed in the 1981-1982 school year.

SUMMARY AND CONCLUSIONS

The findings of this study may be summarized as follows:

1.1 A rural-life curriculum, focused around nine REAP Areas of Study was developed, revised, and is in use in 23 REAP schools.

1.2 A multi-media, activity-based, inservice program was developed and is successfully being used to train teachers to develop and use REAP Learning Activity Packs (LAPs).

1.3 REAP teachers have developed and revised 103 REAP/LAPs for the Senior Primary Grades. None were developed for the Infant or Middle Primary grades.

1.4 In a comparision of the average scores of 509 Non-REAP and 550 REAP students on three successive Primary School Leaving Certificate Examinations, the REAP students had higher scores on all nine subject matter tests. The t-Test results showed that six of the nine average scores were significantly higher for the REAP students.

2.1 Responses to an opinionnaire from parents, teachers, and students at REAP schools, as well as observations, indicate broad positive support for REAP, new agricultural methods, and agriculture as a promising career.

3.1 It was not possible to determine if REAP students completed three agricultural LAPs per year. In the 1978-79 school year, from 69 to 91 percent of students attempting LAPs were reported successful.

3.2 By observation and through reports, it was estimated that REAP students spent 70-105 hours per child, per school year, in agriculturally-related REAP activities at school. Agricultural production was impressive, but uneven.

4.1 Through reports and by direct observation, it was concluded that the contributions of work and items to REAP surpassed the stated criterion.

4.2 Similarly, it was concluded that participation at special events exceeded the criterion.

5.1 A REAP curriculum was established at Belize Teachers' College, approved by the BTC Board of Governors as mandatory for the first year and an elective the second, and accredited by the University of the West Indies.

5.2 An outdoor Education Centre, garden, coops, and hutches, as well as a building for Veterinary Science animals were constructed at BTC.

5.3 Second-year BTC students exceeded the criterion in producing LAPs, which are now being used in REAP schools.

5.4 Although initially various factors had prevented the BTC/REAP students from taking rural-life-oriented field trips, the criterion was surpassed during the 1981-82 school year.

From the data presented and by observation, it is possible to conclude that:

a. Cooperation between the Ministries of the Government of Belize, international agencies, and community groups and individuals have made it possible to develop and implement REAP in 23 rural primary schools and the Belize Teachers' College. A question remains as to whether a successful transition can be made over the next three years (July, 1982 - June, 1985) from support by CARE, Heifer Project International, and the U.S. Peace Corps, to an all Belizean-supported REAP program.

b. A rural-life curriculum, instructional materials (LAPs), inservice training materials, and a two-year program at the Belize Teachers' College show significant progress towards the original curriculum revision goals set for REAP. However, additional time and effort will be required to institutionalize the REAP program as a normal part of rural primary school education.

c. The REAP program has generated widespread support and enthusiasm. However, the institutional linkages necessary to make it possible for REAP graduates to use their new knowledge and skills in their daily lives, or in furthering their educations, have yet to be developed.

Although the Rural Education and Agriculture Program (REAP) has accomplished most of its objectives to a degree that has generated pride and confidence in the overall project outlines, it can only be regarded as a developing program until Belizean control, institutionalization of the curriculum, and institutional linkages become established facts. Then the true test of success, whether or not all of the efforts have resulted in increased opportunities for rural children in furthering their educations or in better coping with the rural environment, can be evaluated.

NOTES

CARE/Belize. Multi-Year Project, 1980-1982. Information quoted from Fact Sheets On the Commonwealth, British Information Services, London, England, 1976.

CARE/Belize. Multi-Year Project, 1980-1982. Information quoted from a Report of the Department of Education for the School Years 1969/1970 and 1970/1971, Ministry of Education, Belize City, Belize, undated.

Evensen, Iverre. An Inventory of Nutrition Education Activities in Belize. Quoted from the 1980 Census of Belize.

Government of Belize/CARE. Rural Education and Agriculture Programme, July, 1976 - June, 1979. CARE/Belize, Belize City, Belize, 1976.

Massey, R. M. The Rural Education and Agriculture Program, A Summative Evaluation. A report prepared for CARE/Belize, Belize City, Belize, 1979.

Ministry of Education and Sports. REAP Inservice Guide and Audio-Visual Materials. Ministry of Education and Sports, REAP Programme Manager, Belize City, Belize, 1979.

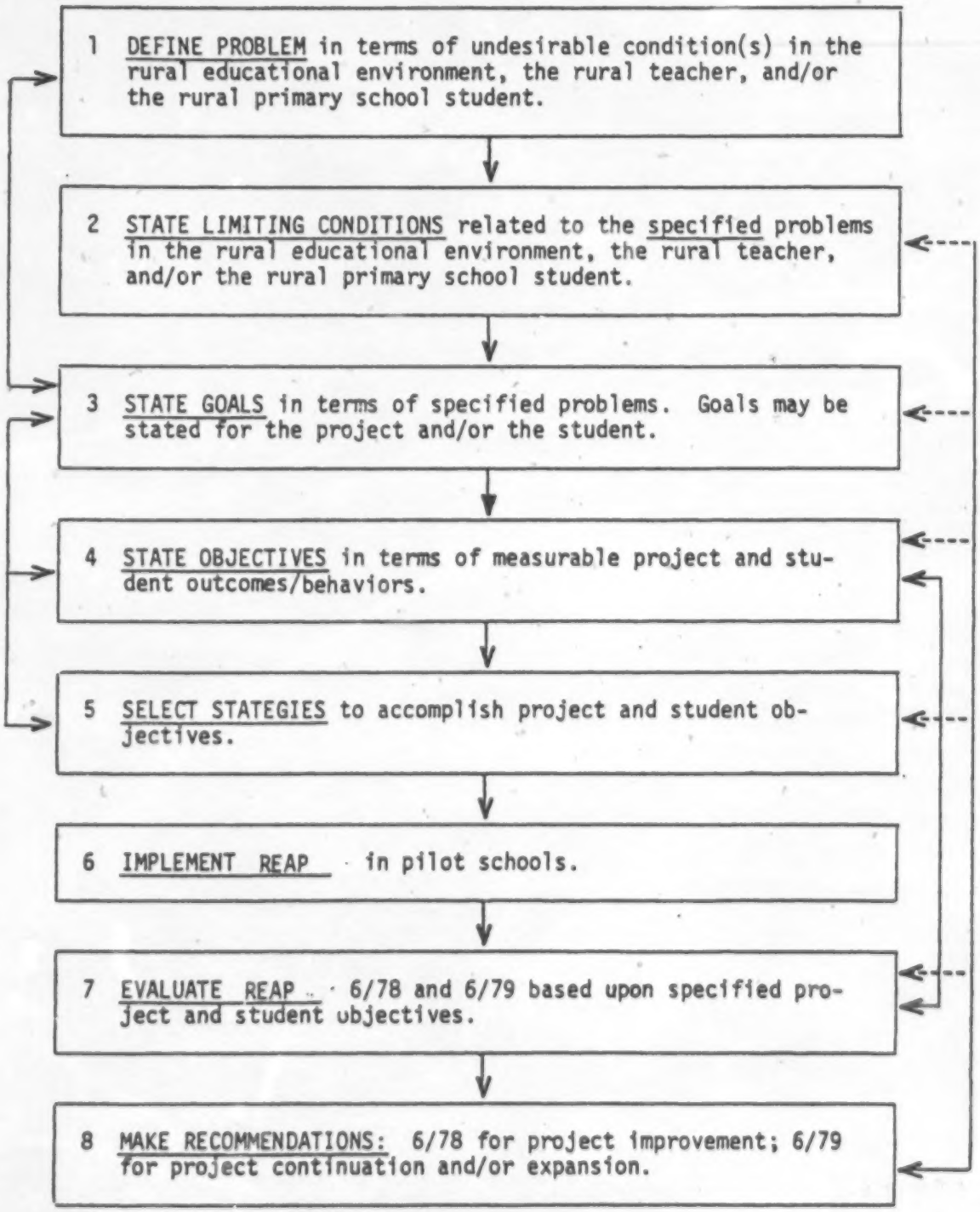
Ministry of Education and Sports. REAP/LAPs. Ministry of Education and Sports, REAP Program Manager, Belize City, Belize, 1981.

APPENDIX A - Belizean and U.S. Primary Grade Equivalents, With Major Belizean Primary School Divisions

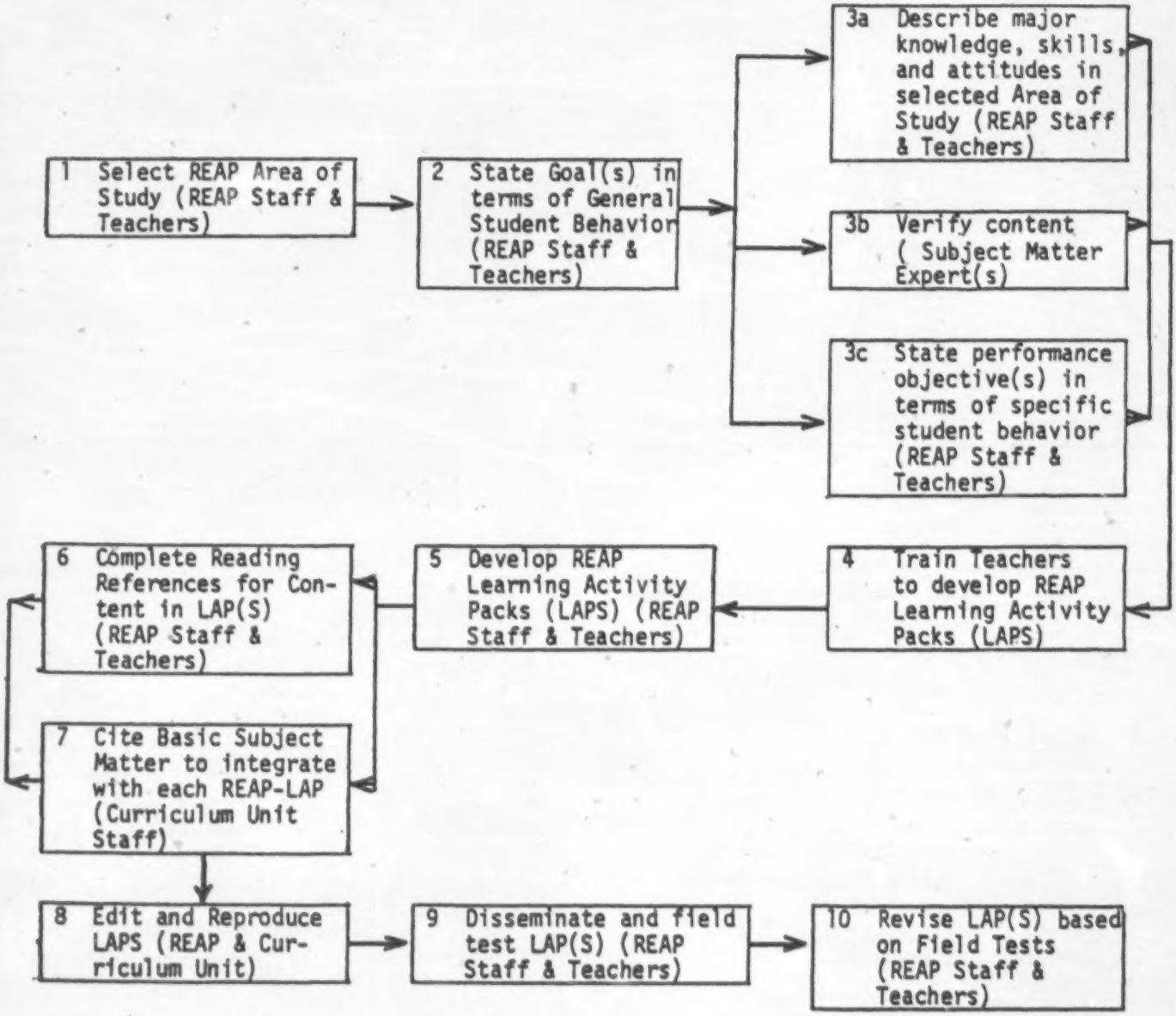
	Belize	U.S.
Infant School Division	Infant I	First Grade
	Infant II	Second Grade
	Standard(Std.)I	Third Grade
Middle Primary Division	Standard(Std.)II	Fourth Grade
	Standard(Std.)III	Fifth Grade
Senior Primary Division	Standard(Std.)IV	Sixth Grade
	Standard(Std.)V	Seventh Grade
	Standard(Std.)VI	Eighth Grade

APPENDIX B - Rural Education and Agriculture Project

(REAP) - Generalized Project Model


1 DEFINE PROBLEM in terms of undesirable condition(s) in the rural educational environment, the rural teacher, and/or the rural primary school student.
2 STATE LIMITING CONDITIONS related to the specified problems in the rural educational environment, the rural teacher, and/or the rural primary school student.
3 STATE GOALS in terms of specified problems. Goals may be stated for the project and/or the student.
4 STATE OBJECTIVES in terms of measurable project and student outcomes/behaviors.
5 SELECT STATEGIES to accomplish project and student objectives.
6 IMPLEMENT REAP in pilot schools.
7 EVALUATE REAP - 6/78 and 6/79 based upon specified project and student objectives.
8 MAKE RECOMMENDATIONS: 6/78 for project improvement; 6/79 for project continuation and/or expansion.

APPENDIX C - REAP Curriculum Development Model


1 Select REAP Area of Study (REAP Staff & Teachers)
2 State Goal(s) in terms of General Student Behavior (REAP Staff & Teachers)
3a Describe major knowledge, skills, and attitudes in selected Area of Study (REAP Staff & Teachers)
3b Verify content (Subject Matter Expert(s)
3c State performance objective(s) in terms of specific student behavior (REAP Staff & Teachers)
4 Train Teachers to develop REAP Learning Activity Packs (LAPS)
5 Develop REAP Learning Activity Packs (LAPS) (REAP Staff & Teachers)
6 Complete Reading References for Content in LAP(S) (REAP Staff & Teachers)
7 Cite Basic Subject Matter to integrate with each REAP-LAP (Curriculum Unit Staff)
8 Edit and Reproduce LAPS (REAP & Curriculum Unit)
9 Disseminate and field test LAP(S) (REAP Staff & Teachers)
10 Revise LAP(S) based on Field Tests (REAP Staff & Teachers)

APPENDIX - D Sample REAP/LAP

LAP No. 1.1.1

RURAL EDUCATION AND AGRICULTURE PROGRAM

LEARNING ACTIVITY PACK (LAP)

I TITLE OF ACTIVITY

Hole in the Ground

II APPROPRIATE GRADE LEVEL(S)

Standards IV, V, VI

III AREA OF STUDY

Soil

IV BASIC SUBJECT(S) INTEGRATED INTO ACTIVITY

Math, Language Arts, Science

V MAJOR CONCEPT(S) AND/OR SKILLS(S)

To identify layers of soil

VI PERFORMANCE OBJECTIVE(S)

The student will draw and label a soil profile which resembles an average soil profile of the local environment indicating in linear/metric the depth of the topsoil and including general characteristics of the topsoil and sub-soil.

VII EQUIPMENT AND/OR MATERIAL

(1) Magnifying glass and microscope
(2) 2 post hole diggers and/or 10 entrenching tools
(3) 2 bags or containers for each group
(4) 2 labels for each group
(5) 1 notebook and 1 pencil for each student
(6) 1 ruler or measuring tape for each group
(7) resource materials and pictures or diagrams of general soil profile

VIII READING REFERENCE(S)

Persad, Ralph Agriculture Science Book 1, Nelson's, 1977

LAP No. 1.1.1

IX PROCEDURE(S) AND RELATED ACTIVITY(IES)

(a) Have students copy into their notebooks the following check list which you have written on the chalkboard.

Date:
Group Name:
Hole Number:
Location of Hole:
Diameter of Hole:
Depth of Hole:
Dept of Topsoil:
Animals and/or objects found in soil:
Description of Topsoil:

Description of Sub-soil:

(b) Divide the class into groups containing four students and have each group select a name such as, type of flowers, vegetables, (the cabbage) animals (the gibnut). Then explain the activity to the students and go over the form, item by item, so the student will know how to record their observations. Each group will be digging holes in different locations around the school compound (middle of a field, near a creek, on a hillside, in the garden). Each task group will choose the location and dig a hole approximately 2 1/2 feet deep and 12 inches in diameter. Have the students collect soil samples, one from near the surface and another from the bottom. The children should then observe the soil profile and try to locate the division between topsoil and subsoil by identifying a color change. The darker soil is topsoil. Using a measuring tape the children will measure the approximate depth of the topsoil. The students will then record the observation such as, animals or objects found in the soil and write brief description of the topsoil and subsoil including color, texture, relative moisture, etc. After 30-35 minutes the students would return to the classroom with completed check lists.

(c) Each group will then make a presentation of their findings. Select a student to record each group's measurement of topsoil and find the average depth.

IX PROCEDURE(S) (continued)

Have the students make labels containing the group's name, location of hole and the location of the 2 soil samples. Arrange all the samples on a table in the learning centre and place the appropriate label beside each. The students will then compare the samples and verbally note similarities and differences.

(d) After finding the average depth of the topsoil, calculate in linear/metric the amount of topsoil in a given area of land.

(e) Using the information of the different groups on location of the holes and depth of topsoil, have the student state verbally or in writing the relationship between the kind of vegetation and the depth of the topsoil.

X EVALUATION

Have the students draw and label an average soil profile, indicating in the drawing and labeling any of the class's general observation or description of the topsoil and subsoil. The drawing should also have an indication in linear/metric of the depth of the soil profile.

Related Activities

Sedimentation

(a) Collect soil samples (i.e., clay, loam, etc.)
(b) Place in a jar and fill to about a half with water
(c) Cover jar and shake vigorously
(d) Place jar on a level area to settle
(e) Note the different layers that are formed

APPENDIX - E Partial List of Contributions or Work (Service) Provided to REAP by Community Members in Fourteen REAP Schools (1979-1980).

Toledo District

San Pedro Columbia - Community members contributed wood and tin sheets for building chicken coops and wooden posts for the garden fence. A post hole digger was provided.

Community members cleared the garden plog, cut big trees, and leveled the land; dug post holes and strung the wire for the garden plot.

San Antonio - Quarry waste donated by the Ministry of Works and transported by the Ministry of Agriculture truck. Rice Mills donated sacks for transporting sand. Grandadilla seedlings and cuttings were contributed. Sand and trucking cement was given by community members. Local Priest donated seeds. Use of truck transport and a load of lumber were donated. Rock donated by local church. Use of agricultural equipment.

Community members cut posts and strung wire for the fence; they prepared the land; dug and constructed a cement holding cistern; erected a thatch hut as plant nursery.

San Isidro - Kerosene and chicks supplied by Principal.

The Ministry of Agriculture twice attempted to dig a well in two separate sites.

Forest Home - Minister provided seeds for garden. Cow manure donated. Rice trash transported by Ministry of Works.

Wire for fence strung by community member. Hutches (3) were built by community.

Fairview - Ministry of Agriculture brought two and Ministry of Works brought one load of rice trash. Use of staples for stringing wire. Sand was contributed. Support for a field trip for REAP students to National Agriculture Fair was contributed.

Stann Creek

St. Matthews - Sixteen packs of vegetable seeds. Citrus Company donated machines to prepare the land, extended the water pipe to the garden area, and donated use of trucks for transportation to Agricultural Fair.

Holy Angels - Land loaned for garden; land cleared by community and ODEC building was painted.

Sittee River - Cement blocks (25) were donated by parents. Seeds contributed by St. Matthews Pomona (REAP) School. Lumber was contributed by a villager. The Cockscomb Company and the Forestry Department mill at Mayflower donated lumber.

Posts were cut by the Village Council. Community members taught students how to construct with thatch. Community hung the wire for the garden.

Hopkins - Posts for garden and fencing constructed by the Community. Community member taught students to thatch the chicken coop.

Belize Rural

Lucky Strike - Farm demonstrator helped the community clear land for the garden, cut the posts, and construct the fence.

Maskall - Land cleared and heavy rocks removed. Topsoil was donated for garden along with transportation. Community cut posts and fenced the garden and assisted in the construction.

Bermudian Landing - Community repaired fence; Ministry of Works installed a pump.

St. Thomas - Ministry of Health installed a pump in the garden. Local family gave water for garden use. Parents contributed to party for REAP children.

Rancho Dolores - Seeds were donated for garden. The men constructed a new seed box and cleared an area behind the the ODEC building.

The community members from Rancho Dolores, Double Head Cabbage, and Bermudian Landing constructed village booths for the agricultural fair held at Bermudian Landing.